

An exploration of MODIS cloud regimes

Lazaros Oreopoulos¹ (Lazaros.Oreopoulos@nasa.gov), Nayeong Cho^{2,1}, Dongmin Lee^{3,1}, Seiji Kato⁴, and George Huffman¹

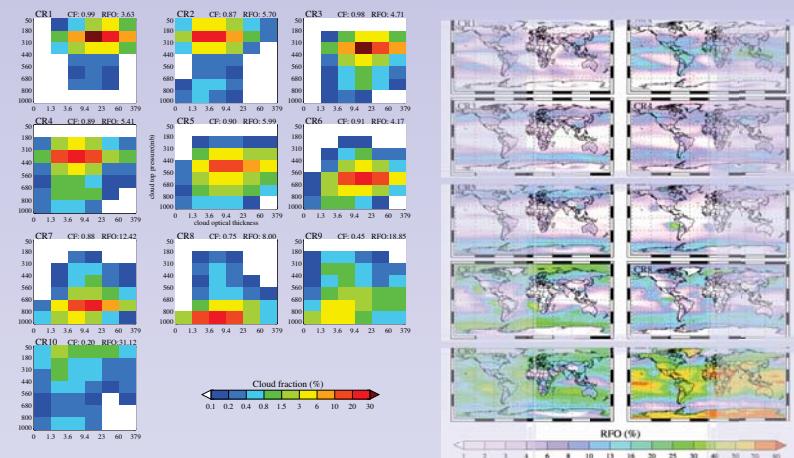
1. NASA's Goddard Space Flight Center 2. USRA's Goddard Earth Sciences Technology and Research 3. Morgan State University 4. NASA's Langley Research Center

Objectives of the study

- To classify cloud mixtures observed by MODIS into “cloud regimes” (CRs) by performing clustering analysis on daily $p_c\tau$ joint histograms.
- To explore the nature of the regimes using other coincident observations.
- To understand regime radiative and hydrological importance.

The MODIS cloud regimes

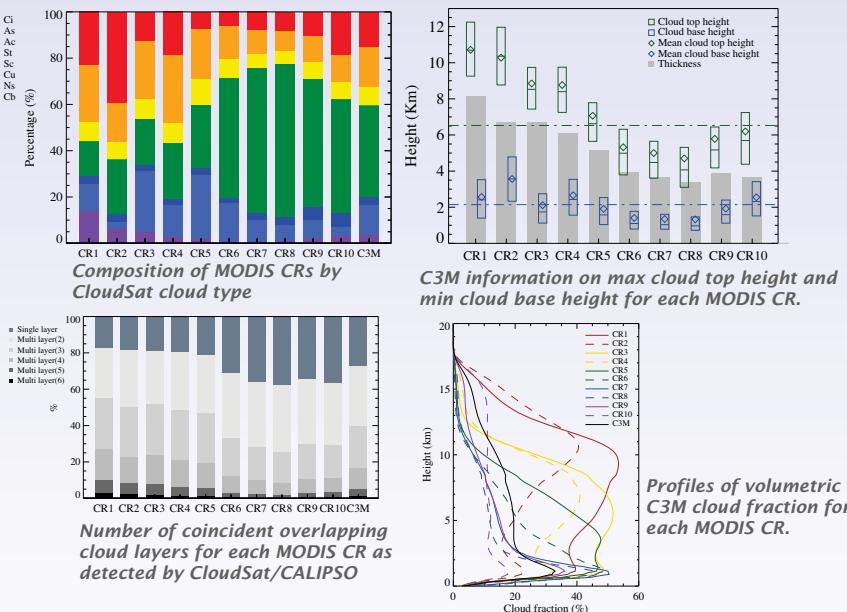
- 10 years of MODIS Terra-Aqua C5.1 daily $p_c\tau$ joint histograms were used.
- Global CRs were derived using clustering analysis, similarly to prior work based on ISCCP histograms.



The MODIS CRs (cluster centroids) derived from clustering analysis. Each regime's global cloud fraction and RFO (relative frequency of occurrence) is provided.

What active observations tell us about the regimes

We use CloudSat/CALIPSO data as aggregated in the C3M product to examine how the MODIS regimes are viewed by active sensors. We use only Aqua CR occurrences to perform this compositing in order to achieve better spatiotemporal matching.

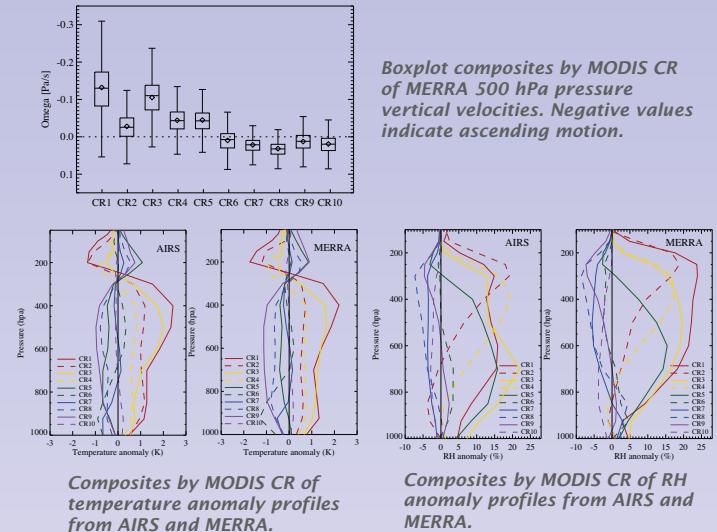


Acknowledgements

Funding by NASA's Modeling Analysis and Prediction (MAP), CloudSat/CALIPSO Science Team, and Science of Terra-Aqua programs is gratefully acknowledged.

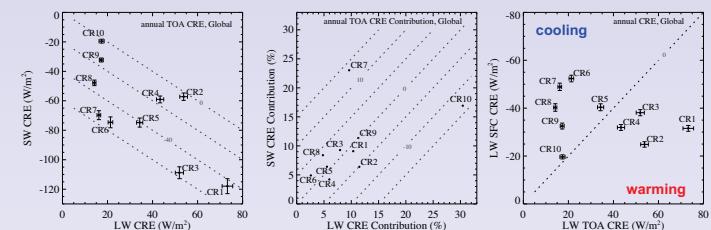
Meteorology associated with MODIS CRs

We composite 500 hPa vertical velocity from MERRA and AIRS/MERRA temperature and RH anomaly profiles in order to glean relationships between MODIS CRs and meteorology.



Regime cloud radiative effect breakdown

We are interested in the SW, LW and net CRE of the MODIS regimes, in order to delineate their radiative distinctiveness, radiative importance, and influence on atmospheric heating. We use CERES SYN 1deg combined Terra-Aqua diurnal averages for the compositing of gridcells with the same Terra and Aqua CR.



Regime rainfall

Similarly to CRE we also composite GPCP 1deg daily precipitation to get insight into the hydrological importance of MODIS CRs.

